

Recommendations on a Monitoring Scheme for Polybrominated Diphenyl Ethers (PBDEs) in Puget Sound

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Introduction

Polybrominated diphenyl ethers (PBDEs) are a class of flame retardants that can be persistent, bioaccumulative, and toxic to both humans and wildlife. Phase-out regulations will prevent new PBDEs from being produced, which will help protect the environment from further contamination. However, PBDEs are currently found in a large range of long-lasting products (furniture, electronics, polyurethane foam, etc.), so they will likely continue to be released into the environment.

In coordination with the National Marine Fisheries Service (NMFS), EPA Region 10's Office of Water and Watersheds hosted a series of technical workgroups during spring 2013 on the following topics:

- PBDE removal efficiency in wastewater treatment plants;
- PBDE modeling in Puget Sound (fate, transport, and bioaccumulation);
- The need to establish a PBDE toxicological threshold for Southern Resident Killer Whales; and
- No Observed Effect Concentration (NOEC) levels of mixtures of persistent organic pollutants (including PCB and PBDE congeners).

Subsequent to the technical workgroups, EPA Region 10 hosted a policy forum on PBDEs and Southern Resident Killer Whales on June 6th, 2013. The policy forum provided an opportunity for senior level staff at the Washington State Department of Ecology (Ecology), NMFS, the Puget Sound Partnership, and EPA to learn about and discuss the issues surrounding PBDEs in Puget Sound, especially as they relate to killer whales. To learn about the Environmental

Protection Agency Region 10's work on PBDEs in Puget Sound, please visit <http://www.eopugetsound.org/articles/report-potential-effects-pbdes-puget-sound-and-southern-resident-killer-whales>.

During fall of 2013, EPA convened a sub-group of the Puget Sound Ecosystem Monitoring Program (PSEMP) Toxics Workgroup and the PSEMP Marine Mammals Workgroup to make recommendations on a monitoring scheme for PBDEs in Puget Sound (for more information about PSEMP, see <https://sites.google.com/a/psemp.org/psemp/home>). The PSEMP Toxics and Marine Mammal Workgroups have been engaged in an on-going effort to inventory and prioritize toxics and marine mammal related monitoring in the Puget Sound. The Workgroups include participation from scientists and interested parties from many state, local, and federal agencies, as well as from NGOs and the private sector.

The PSEMP Workgroups engaged with EPA's effort on PBDE monitoring, as it aligned well with overall prioritization efforts. The subgroup involved in the PBDE monitoring efforts included representatives from Ecology, NMFS, the Washington State Department of Fish and Wildlife, and the Puget Sound Institute at the University of Washington Tacoma. Members of this subgroup consider these PBDE-specific recommendations to be supportive of (but do not necessarily supersede) the overall recommendations reached by the PSEMP Toxics and Marine Mammals Workgroups.

Recommendations

1) Toxics in Fish & Sediment

We strongly recommend maintaining existing long-term monitoring efforts for Chinook and Coho salmon, English Sole, Herring, and sediment.

We support monitoring for the Puget Sound Partnership's Vital Signs/Dashboard Indicators. These include toxics in fish (Chinook and Coho salmon, English Sole, and Herring). The Vital Signs/Dashboard Indicators also includes monitoring of contaminants in sediment. Ecology's Marine Sediment Monitoring Team has measured PBDE levels in Puget Sound sediments since 2004. Locations include ten long-term monitoring stations and randomly selected stations from eight monitoring regions and six urban bays. This recommendation is consistent with the results of the PSEMP Toxics Workgroup overall prioritization effort; both Toxics in Fish and Toxics in Sediments have been identified amongst the highest priority monitoring programs for the Puget Sound.

2) Marine Mammals: Southern Resident Killer Whales & Harbor Seals

Southern Resident Killer Whales are protected under the Endangered Species Act. There is evidence of PBDEs in Southern Resident Killer Whales (SRKW), as well as their main prey (Chinook salmon), and PBDEs are recognized as a threat to the recovery of the population. We recommend continued PBDE monitoring via NOAA's blubber biopsies and the University of Washington's Center for Conservation Biology's "Causes of Decline Among Southern Resident Killer Whales" program. This recommendation is consistent with the SRKW Recovery Plan.

Harbor seal monitoring is important for food web/bioaccumulation modeling. Harbor seals are a good indicator species because they are abundant and non-migratory and, as a top predator, they consume a variety of prey species. Monitoring toxics in harbor seals, which would include PBDEs, has been identified as one of the highest priority monitoring activities for the Puget Sound by both the PSEMP Toxics Workgroup and the Marine Mammal Workgroup. There is currently no regular monitoring of toxics in marine mammals in Puget Sound.

3) Refine Loading Estimates

According to Ecology and King County's Toxic Loadings Analysis (www.ecy.wa.gov/biblio/1103055.html), PBDEs reach Puget Sound via atmospheric deposition (44-56%), publicly owned treatment works (25-38%), and surface runoff (18%). However, recent data suggest that current (Phase 3) loading estimates may be too low. We recommend additional monitoring to better capture PBDE loadings to Puget Sound.

4) Mussels

We recommend continuing Puget Sound Mussel Watch (part of NOAA's National Mussel Watch Program). Mussels are a high quality indicator species for toxics in nearshore areas, and provide site-specific exposure information. The most recent sampling occurred at over 100 sites in 2013 and there are long-term records available for multiple contaminants. Monitoring toxics in mussels, which would include PBDEs, was selected as one of the PSEMP Toxics Workgroup highest priority monitoring activities for the Puget Sound.

5) Water Column Concentrations

We recommend a one-time sampling event to measure PBDE levels in water column concentrations, with the Strait of Juan de Fuca as the highest priority location, and interior locations in each of the basins and urban bays as the next priority. These data would assist in calibrating models of fate, transport, and bioaccumulation.